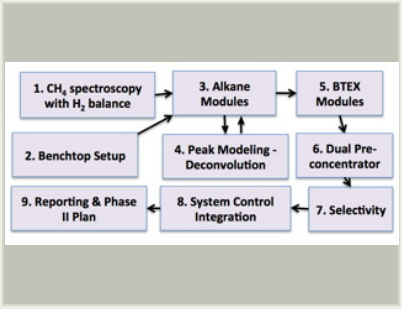
A total Ammonium Reactor (NHxR) for In-Situ Mobile Measurements: A Critical Tool to Understand Aerosol Formation, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

We will develop, demonstrate, and optimize a front-end ammonium reactor (NHxR) for the fast, precise, and accurate measurement of gas-phase ammonia (NH3) and particle-phase ammonium ion (NH4+) by fast, high-flow Cavity Enhanced Absorption Spectroscopy (CEAS). We address Focus Area 9, Sub Topic S1.08 Value Proposition: There is a need to measure the total atmospheric NHX load (NH3+NH4+), with significant ecosystem implications including eutrophication, air quality, and indirectly on atmospheric radiative balance. Current NH3 analyzers miss most of the atmospheric NH3 load, present as fine aerosols. The Innovation: The front-end NH4+ reactor cycles between a line that passes gas phase NH3 to the CEAS analyzer, and then a line where NH4+ aerosols are converted to NH3. A key innovation is flow path material, for which the literature is confused, with significant differences between Teflon formulations (factor of 10 difference in adsorption for PFA versus PTFE by one study). This fast, in situ, analyzers, will enable measurements at dramatically lower per sample cost and far greater data density than aerosol samplers. The ability to measure both NH3 and NH4+ sufficiently rapidly will allow characterization of the strong heterogeneity exhibited by these short-lived species with localized emissions. The NHxR is developed in collaboration with Los Gatos Research, a major manufacturer of state-of-the-art trace gas analyzers with extensive market awareness and well-established clients. BRI retains intellectual property to the NHxR and will license the NHxR for manufacture, potentially by LGR. LGR partnership provides significant commercialization advantages. Dr. Leifer (BRI - Team leader), has led multi-institution, multiple-aircraft NASA campaigns. BRI conducts numerous field studies to solve real-world problems, field expertise that aids in solution-development to meet NASA and market needs.



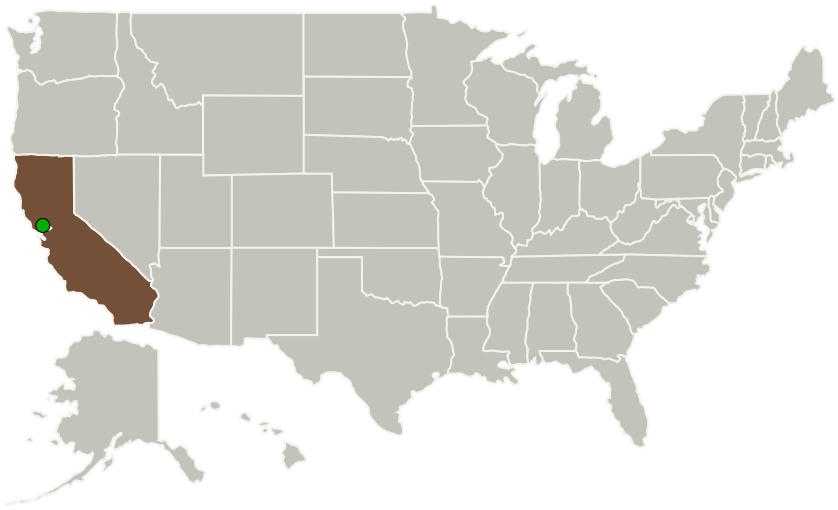
A total Ammonium Reactor (NHxR) for In Situ Mobile Measurements: A Critical Tool to Understand Aerosol Formation, Phase I Briefing Chart Image

Table of Contents

A total Ammonium Reactor (NHxR) for In-Situ Mobile Measurements: A Critical Tool to Understand Aerosol Formation, Phase I

Completed Technology Project (2017 - 2017)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Bubbleology Research International	Lead Organization	Industry	Solvang, California
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations
California

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Bubbleology Research International

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

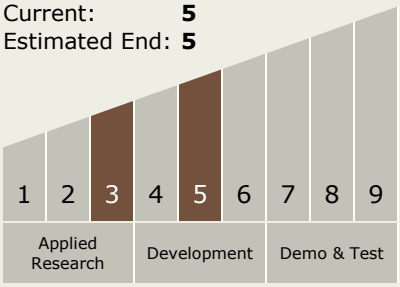
Carlos Torrez

Principal Investigator:

Ira Leifer

Technology Maturity (TRL)

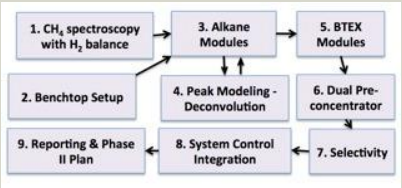
Start: **3**
Current: **5**
Estimated End: **5**



A total Ammonium Reactor (NHxR) for In-Situ Mobile Measurements: A Critical Tool to Understand Aerosol Formation, Phase I

Completed Technology Project (2017 - 2017)

Images



Briefing Chart Image
A total Ammonium Reactor (NHxR) for In Situ Mobile Measurements: A Critical Tool to Understand Aerosol Formation, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/135331)

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.4 Environment Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System